September 20, 2005

DECLARATION

The undersigned, Jan McLin Clayberg, having an office at 5316 Little Falls Road, Arlington, VA 22207-1522, hereby states that she is well acquainted with both the English and German languages and that the attached is a true translation to the best of her knowledge and ability of the specification and claims of international patent application PCT/DE 2004/002129 of Stierle, P., et al., entitled "ELECTRIC POWER TOOL".

The undersigned further declares that the above statement is true; and further, that this statement was made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or document or any patent resulting therefrom.

Jan McLin Clayberg

ELECTRIC POWER TOOL

Prior Art

The invention is based on an electric power tool as generically defined by the preamble to claim 1.

In right-angle grinders, the cooling air required for cooling the electric motor is as a rule aspirated through lateral air inlet openings, which are located in the rear portion of the housing. It is also known to provide air inlet openings on a rear end face of the housing as well. In typical air courses, the cooling air is aspirated into the interior of a housing through a fan located on the armature shaft. Along the way from the air inlet to the air outlet, the cooling air strikes various components in the interior of the housing that deflect the cooling air, making it turbulent and slowing it down.

In various electric power tools, the housing can be used as a handle, but then there is the risk that the lateral air inlet openings will be covered by the user's hand, and then air is aspirated only through the face-end air inlet openings. However, those openings are relatively small in proportion to the lateral openings, and so only little air can reach the housing. The lateral air inlet openings cannot be made arbitrarily longer or larger, though, because then the spacings from current-carrying parts in the interior of the housing that might otherwise be needed cannot be adhered to.

Advantages of the Invention

The invention is based on an electric power tool,

having an electric motor located in a housing and having a cooling device.

It is proposed that the cooling device, at least in some regions, has a cooling conduit that is closed off from an interior of the housing. The cooling medium, preferably cooling air, can be purposefully made to bypass interfering components. A high flow speed and a high volumetric throughput can be achieved. Any dirt aspirated with the cooling air can be made to flow past vulnerable parts such as brushes or switches, and dirt can be prevented from becoming deposited on them. Because of the purposeful course of the cooling medium, the temperature at the electric motor drops, which increases its efficiency and lengthens its life. Precisely in heavy-duty right-angle grinders, this arrangement offers major advantages. A substantially closed cooling conduit should be understood in particular to mean cooling conduits that have recesses such as slits, small holes and the like that are at least largely negligible in fluidic terms.

If the cooling conduit is let into a support plate of a motor housing, then it can favorably be already provided upon manufacture of the support plate and incorporated into the support plate in a space-saving, optimized way.

If the cooling conduit is covered with a cover plate, a closed cooling conduit can be furnished, in which the cooling medium can flow unimpeded by components in the interior of the housing. Removing the cover plate makes it possible to clean the cooling conduit easily as needed.

If the cover plate is embodied integrally with a motor housing, then a separate cover plate can be dispensed with.

Manufacture is especially simple, and if the motor housing is made by injection molding, the cover plate is simple to mold jointly with it.

If the cooling conduit discharges into an intake nozzle that protrudes from the housing, then it is practically precluded that the intake nozzle will be covered by mistake when the user is working with the electric power tool. Moreover, cooling air reaches the cooling conduit directly and unhindered and can be carried directly wherever it is needed. The cross section of the cooling conduit is variable and will be provided by one skilled in the art to suit the requirements of the particular electric power tool. Fundamentally, however, it is also conceivable for the cooling conduit or an intake nozzle to be flush with the housing, particularly in the region outside a grip region, so that places where dirt could become deposited are advantageously avoided.

If the intake nozzle is located in a face end of the housing, the cooling conduit can be supplied with cooling air without hindrance, even if the housing serves as a handle.

If the cooling conduit has an essentially rectilinear course, then the cooling air reaches the electric motor unhindered, without hindrance from components that stand in the way of the flow. Less turbulence is created in the flow path, so that any dirt entrained is less able to become deposited, and a high speed of the cooling medium can be maintained. Smaller inlet openings can be provided for furnishing a required quantity of cooling medium.

If at least two cooling conduits are provided, then better distribution of the coolant supply can be made. The

number of cooling conduits is variable and will be selected by one skilled in the art to suit the requirements of the particular electric power tool. In principle, however, it is also conceivable for only one cooling conduit to be provided.

If lateral and/or face-end air inlet conduits are provided, then cooling of components in the interior of the housing can also be done, without impairing the cooling of the electric motor.

The electric power tool is especially advantageously embodied as a right-angle grinder, in which an overload on the drive can in principle easily occur, which necessitates especially reliable cooling.

Drawings

Further advantages will become apparent from the ensuing description of the drawings. In the drawings, one exemplary embodiment of the invention is shown. The drawings, description and claims include numerous characteristics in combination. One skilled in the art will expediently consider these characteristics individually as well and put them together to make useful further combinations.

Shown are:

Fig. 1, a preferred right-angle grinder;

Fig. 2, details of a housing in the prior art;

Fig. 3, details of an air course of the prior art;

Fig. 4, a view of a support plate, with cooling

conduits according to the invention;

Fig. 5, the cooling conduits of Fig. 4 with a cover plate;

Fig. 6, the arrangement of Fig. 5 with the switch installed;

Fig. 7, a detail of a full assembled housing with intake nozzles.

Description of the Exemplary Embodiment

Fig. 1 shows an electric power tool in the form of a preferred right-angle grinder, with an electric motor located in a housing 10 and with a cooling device, in which an intake nozzle 20 is located on the rear face end of the housing 10. The right-angle grinder may additionally have a handle that protrudes from the housing 10 at an angle. The housing 10 itself is also used as a handle. The electric motor preferably drives a rotationally drivable tool insert 12, such as a grinding wheel.

Figs. 2 and 3 illustrate a cooling air course in accordance with the prior art. The same elements are identified by the same reference numerals throughout the drawings. The housing 10 is cut open to show conditions in the interior of the housing 10. Air aspirated by a fan, not shown, flows through lateral and face-end air inlet openings 18, 16 into the housing 10. The lateral air inlet openings 18 may be provided on both sides of the housing 10. After entering the housing 10, the cooling air strikes components, such as the switch 22 and electronics 24, that intrinsically require no cooling, or only little cooling. On flowing past

these components 22, 24, eddies are created, which slow down the cooling air and cause dirt entrained with it to become deposited there. The heavy arrows in the drawings (Fig. 2 and Fig. 3) are intended to indicate that after the cooling air enters, it must first flow around obstacles in the form of the components 22, 24, before it reaches the interior of a motor housing 26, where it is needed for cooling the armature and pole piece of the electric motor.

The arrangement according to the invention is shown in the following Figs. 4 through 7. Two cooling conduits 30 are let into a support plate 28 in the motor housing 26 and extend essentially rectilinearly from two intake nozzles 20, located in a face end 14 of the housing 10, to the motor housing 26 (Fig. 4). The intake nozzles 20 protrude from the housing 10. The cooling conduits 30 are covered by a cover plate 32 (Fig. 5), so that airtight cooling conduits 30 are formed. The cover plate 32 may be joined either detachably or fixedly to edges of the cooling conduits 30, for instance being glued, screwed or clamped onto the cooling conduits 30. The cover plate 32 may be formed of a single piece for all the cooling conduits 30, or a separate cover plate 32 may be provided for each cooling conduit 30.

Fig. 6 shows a switch 22, which is mounted in the housing on the cooling conduits 30 or the cover plate 32. In the cooling conduits 30, the cooling air reaches the motor housing 26 unaffected by the switch 22.

Fig. 7 shows a fully assembled housing 10 with additional face-end and lateral air inlet openings 16, 18. The intake nozzles 20 for the closed cooling conduits 30 in the interior of the housing 10 are located between a cord connection 34 and the air inlet openings 16 in the face end

14 of the housing 10.

List of Reference Numerals

10	Housing
12	Tool insert
14	Face end
16	Air inlet openings
18	Air inlet openings
20	Intake nozzle
22	Switch
24	Electronics
26	Motor housing
28	Support plate
30	Cooling conduit
32	Cover plate
34	Cord connection